California's Early Coverage Expansion under the Affordable Care Act: A County-Level Analysis

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ABSTRACT

Objective: To assess the coverage effects of California's 2011 Low-Income Health Program (LIHP), enacted as an "early expansion" under the Affordable Care Act (ACA), and to demonstrate the feasibility of using Census data to measure county-level coverage changes.

Data Sources/Study Setting: 2008-2012 American Community Survey (ACS). The sample contained California adults ages 19-64 (n=237,876) and children 0-18 (n=113,159) with incomes below 200% of the federal poverty level.

Study Design: Differences-in-differences analysis comparing public coverage, private insurance, and the uninsured rate in counties that expanded LIHP in 2011 versus California counties not expanding during this time. Additional analyses tested for heterogeneous impacts of LIHP and spillover effects on children.

Principal Findings:
Compared to non-expansion counties, public coverage for adults increased by 1.8 percentage points (p=0.02) in expanding counties, while the uninsured rate declined by 2.1 percentage points (p=0.01). There was no significant change in private coverage. Public coverage gains were largest for Latinos and those with limited English proficiency. The expansion produced a positive spillover effect on children's Medicaid enrollment.

Conclusions:
California's 2011 expansion produced significant increases in public coverage for low-income individuals, particularly Latinos. Sub-state coverage analyses with the ACS can add valuable detail to future assessments of the ACA.

Key Words: Medicaid, health reform, uninsured, disparities, state policies

INTRODUCTION

The Affordable Care Act's (ACA) major coverage expansions are underway. Evidence from several surveys shows large declines in the uninsured rate, particularly in states that expanded Medicaid beginning in 2014 (Carman, Eibner, & Paddock, 2015; Cohen & Martinez, 2014; Shartzer, Long, Karpman, Kenney, & Zuckerman, 2015; B. D. Sommers, Musco, et al., 2014). However, questions remain on the patterns of enrollment across demographic groups and potential spillover effects on children. Moreover, as coverage expansions under the ACA continue, it will be important to understand differential impacts of these expansions not just between states but also within states.

Several states began to expand coverage for low-income adults under the ACA prior to 2014, using the law's early Medicaid expansion option and/or Section 1115 waiver programs. Previous research on 2010 Medicaid expansions in Connecticut and the District of Columbia (D.C.) demonstrated significant gains in coverage, particularly for adults with health-related limitations, and heterogeneous impacts on private insurance, with higher levels of crowd-out for young adults but little crowd-out in other groups (B. D. Sommers, Kenney, & Epstein, 2014). However, the populations in Connecticut and D.C. offer limited statistical power for subgroup analyses and have small proportions of Latinos, a key demographic group for assessing disparities in coverage (Bustamante & Chen, 2012). Non-ACA expansions of public coverage have yielded important insights into enrollment behavior, though these studies were also limited to smaller states with fewer minorities, such as Massachusetts, Oregon, and Wisconsin (DeLeire, Dague, Leininger, Voskuil, & Friedsam, 2013; Finkelstein et al., 2012; S. K. Long, Stockley, & Dahlen, 2012). Finally, none of these studies examined coverage changes at a sub-state level of

geography, such as by city or county, which can be useful in identifying areas of uneven gains from the ACA and may also improve ongoing outreach efforts for coverage expansion.

Our objective was to examine county-level patterns of coverage changes following California's early expansion in 2011, called the Low Income Health Program (LIHP). The LIHP was a Medicaid 1115 waiver program that gave counties the option of enrolling low-income adults in coverage that provided access to safety net organizations and other contracted providers (Meng, Cabezas, Roby, Pourat, & Kominski, 2012). Counties could choose to expand to an income level up to 200% of the federal poverty level (FPL), but most elected to expand only to the ACA's Medicaid cutoff of 133% of FPL or even lower. LIHP – though not technically part of the state's Medi-Cal program – was designed to provide public means-tested health coverage to the population targeted by the ACA's Medicaid expansion.[1] Thus, California's LIHP allows an assessment of the impacts of public insurance expansion on a more diverse population than previously-studied ACA Medicaid expansions (Harbage & King, 2012), and serves as a valuable test-case of the feasibility of using data from the American Community Survey to track changes in insurance over time at the sub-state level.

METHODS

Study Design

Our study used a differences-in-differences design to compare changes in coverage among counties that participated in the LIHP ("expansion counties") to changes among counties in California that were not expanding coverage via the LIHP during this period ("control

[1] Due to these strong similarities between LIHP and Medicaid coverage, for brevity and for comparison purposes to other states, at times we refer to the LIHP as an "early Medicaid expansion," though it technically was not part of the state's Medicaid program.

counties"). The pre-expansion period was 2008-2010, and the post-expansion period was 2012. 2011 was omitted as a transitional year.

Our analysis used a within-state, county-based control group instead of comparing California to other states for several reasons. First, most other Western states that would be plausible controls for California were undergoing significant Medicaid policy changes shortly before or during our study period. Second, the demographics of other states in the Western Census region are much different for low-income adults; in particular, most of these states have far fewer Latinos. Meanwhile, non-expanding counties within California had more similar demographic patterns and policy environments to the expansion counties.

The expansion group included all California counties that expanded by the end of 2011, and our control group included the counties that had not expanded by the fourth quarter of 2012, the last year of our study period (Meng et al., 2012). In total, there were 10 expansion counties and 7 control counties for our main analyses; as mentioned earlier, counties had the option to expand LIHP to an income level up to 200% of FPL, but most elected lower income cutoffs (see Appendix Table 1 for details). Prior to LIHP, parental eligibility for Medi-Cal was set at 106% of FPL. Meanwhile, childless non-disabled adults had generally not been eligible for public coverage outside of a waiver program called the Health Care Coverage Initiative (Pourat et al., 2012). This program existed in our study's ten expansion counties from 2007-2010, with a total enrollment of just under 150,000 people as of the fourth quarter of 2010 (Kominski et al., 2014), but was subject to an enrollment cap and was ultimately rolled into the larger LIHP (B.D. Sommers, Arntson, Kenney, & Epstein, 2013).

Counties expanding between January and August 2012 were excluded from our primary analysis; this group included 35 of California's less populous rural counties that comprise a

consortium called the County Medical Services Program (CMSP). Our study design depends on the assumption that changes in coverage outcomes in the expansion and control counties would have been the same in the absence of the expansion. In support of this assumption, we offer graphical and statistical evidence that pre-expansion trends in coverage were similar between expansion and control counties.

Data and Sample

Our primary data source was the Census Bureau's American Community Survey (ACS). The ACS is the nation's largest household survey: each year of the public-use data file includes approximately 3 million individuals nationwide and nearly 370,000 people from California alone. Because the ACS began assessing health insurance in 2008 (Davern, Quinn, Kenney, & Blewett, 2009), our study period included data from 2008-2012. The ACS provides rich within-state geographical detail using Public Use Microdata Areas (PUMAs). PUMAs are mutually-exclusive areas within a state containing at least 100,000 individuals, based on the decennial Census. In the 2012 dataset, PUMAs were redrawn to account for updated information from the 2010 Census, which means that 2008-2011 PUMAs do not map directly to the 2012 PUMAs. Fortunately, nearly all PUMAs map consistently to the county level within California, with two minor exceptions. One small county (Plumas) was originally combined in a PUMA with another larger county, then shifted in 2012 to a PUMA containing a different larger county. Our primary sample excludes these PUMAs, but a sensitivity analysis (see Appendix Table 1) including the PUMAs with Plumas County – which accounted for just 2% of the total sample – found similar results. The 2012 PUMAs also combined San Benito and Monterey Counties, which had

previously been in separate PUMAs. Since these two counties enacted expansions at different times, we excluded both from the sample.

Our study population contained 237,876 adults ages 19-64 with family incomes at or below 200% of the FPL. We chose this threshold because several counties expanded eligibility up to this point (Appendix Table 1). Family income was calculated as a percentage of FPL for the health insurance unit, which includes an adult, his/her spouse (if present), and any dependent children in the household. We calculated poverty thresholds using the year-specific guidelines from the U.S. Department of Health and Human Services ("Prior HHS Poverty Guidelines and Federal Register References," 2014).

We also tested for any spillover effects on children's Medicaid coverage during this period by evaluating changes in coverage among children in families with incomes at or below 200% FPL. The sample for this analysis included 113,159 children ages 0-18.

Outcomes

We analyzed three coverage outcomes: 1) Medicaid or other means-tested public coverage (which includes coverage through the LIHP); 2) uninsurance; and 3) private health insurance coverage. The ACS question about Medicaid and other low-income public coverage asks if a respondent is covered by, "Medicaid, Medical Assistance, or any kind of government-assistance plan for those with low incomes or a disability?" While LIHP is technically distinct from Medi-Cal, it is likely that many respondents would not have known the difference, and in any event the ACS question includes both in the same category.

For individuals reporting more than one type of coverage, we used a health insurance hierarchy to assign a primary source of coverage in the following manner: 1) Medicare; 2)

Medicaid/means-tested public coverage; 3) Employer-sponsored insurance (ESI); 4) Non-group private insurance; 5) Other insurance; 6) Uninsured. For instance, adults dually eligible for Medicare and Medicaid were treated as having Medicare as their primary coverage, and people reporting both non-group and Medicaid coverage were treated as having Medicaid. In sensitivity analyses, we tested the effect of not using a hierarchy (allowing people to have more than one type of coverage), or using an alternative hierarchy in which ESI preceded Medicaid.[2] For children, Medicaid and ESI both preceded Medicare.[3]

In our results below, for brevity, we refer to the combined category of Medicaid/means-tested public coverage outcome as "public coverage."[4]

Statistical Analysis

First, we compared the unadjusted percentages for each outcome in expansion and control counties over time. Then, we conducted three multivariable differences-in-differences regressions, in which the dependent variables were – in turn – public coverage, uninsured, or private insurance. We also separately analyzed ESI and non-group private insurance, since the ACS significantly overestimates the latter compared to other data sources (Mach & O'Hara, 2011); these results are reported in the Appendix.

Multivariable analyses used the following regression equation for each insurance type:

$$Public\ Coverage_{ict} = \beta_0 + \beta_{LIHP}\ Post2011_t * Expansion\ County_c + \beta_1 X_{ict} + \mu\ Year_t + \Omega\ County_c + \varepsilon_{ict} \qquad \text{Equation (1)}$$

[2] The results were similar in these analyses and are available from the authors upon request.
[3] Medicare coverage among children is largely limited by statute to those with end-stage renal disease, which has a prevalence of 100 per 1 million (0.01%) in the 0-18 age group (Harambat, van Stralen, Kim, & Tizard, 2012). However, 0.8% of California's children in the ACS report Medicare coverage, most of which likely reflects respondent error.
[4] Technically, "public coverage" would generally include Medicare and military coverage, but here we are using it as shorthand for the ACS's question on public coverage for low-income persons.

where *i* indexes individuals, *c* counties, and *t* year. μ is a vector of year fixed effects, and Ω is a vector of county fixed effects. The year fixed effects (μ) capture the direct impact of "Post-2011," and the county fixed effects (Ω) capture the direct impact of "Expansion County"; as such, we omitted the main effects of "Post-2011" and "Expansion County" in our regressions. The coefficient of interest was β_{LIHP}, which identified the change in coverage associated with the LIHP in expansion counties after subtracting the changes observed in the control counties. Models replacing the year and county fixed effects with "Post-2011" and "Expansion County" variables produced nearly identical results.

Models adjusted for a vector of economic and demographic factors (X_{ict}) including age, gender, marital status, parental status, race, ethnicity (Mexican, other Latino, and non-Latino), English proficiency (speaks English very well, or not), education, citizenship, presence of a non-citizen in the family, income (as a percentage of FPL), employment, and disability (presence of a major health-related limitation assessed in the ACS). For analyses of children, educational attainment referred to the highest attainment of any adult in the family, and non-English proficiency referred to families in which no adult was proficient in English.

We tested for heterogeneous effects of the expansion by stratifying our sample based on race/ethnicity, English proficiency, gender, income, parental status, and self-reported disability. We also examined Los Angeles County separately from other expansion counties, given its size and unique features.

We used linear probability models for ease of interpretation of the magnitude of coverage changes (Karaca-Mandic, Norton, & Dowd, 2012). We employed robust standard errors clustered at the county-level to account for potential serial auto-correlation within counties

(Bertrand, Duflo, & Mullainathan, 2004). Analyses used the ACS survey weights and were conducted using Stata 12.0.

In sensitivity analyses, we considered several alternative treatment groups: counties expanding to at least 100% FPL; counties expanding to at least 133% FPL; counties expanding eligibility in January 2012; and counties expanding LIHP eligibility before October 2012. We also analyzed a narrower income band corresponding to the ACA's 2014 Medicaid expansion (adults at or below 133% FPL). We assessed the effect of excluding non-citizens with less than 5 years' residence in the U.S., who were generally not eligible for LIHP; as well as the effect of excluding 19-25 year-olds from the sample, since this age group became eligible for parental insurance under the ACA's dependent coverage provision during the study period. Finally, we estimated a model with 2011 included as a post-expansion year since many counties expanded mid-2011.

Using data limited to 2008-2010, we tested the underlying assumption of parallel pre-expansion trends in coverage between expansion and control counties (both for the full sample and within each subgroup). We fitted a modified Equation 1, replacing the year fixed effects with a linear time trend and the differences-in-differences estimator with an interaction term between the time trend and *Expansion County*, which identified any pre-expansion divergence in coverage patterns.

RESULTS

Table 1 presents summary statistics for expansion and control counties. Given the large sample size, all comparisons were statistically significant, though absolute differences for most variables were small. There was a lower percentage of whites in the expansion counties (52%

versus 62%), and slightly higher percentages of Asians and non-Mexican Latinos. Overall, 52% of the expansion county sample was Latino versus 48% in the control counties. Non-English speakers were highly prevalent: 38% of individuals in expansion counties lacked English proficiency, compared to 29% in control counties.

Figures 1 and 2 show unadjusted trends in public coverage and the uninsured rates for expansion and control counties. The percentage of low-income adults with public coverage in control counties was roughly 9 percentage points higher in 2008-2010 than in the expansion counties, but this gap narrowed to 7 percentage points in 2012. The uninsured rate was 4 percentage points higher in expansion counties prior to expansion, but dropped to a 2 percentage-point gap in 2012. In both figures, the curves appear parallel prior to 2011, offering graphical support for the differences-in-differences approach. Appendix Figures 1-2 show these trends for Los Angeles County separate from other expansion counties. The general pattern over time was quite similar, though Los Angeles had a higher baseline uninsured rate.

Table 2 presents the regression results. In our primary analysis, the LIHP expansions were associated with a significant increase in public coverage of 1.8 percentage points (p=0.02) in expansion counties relative to the control group. There was a concomitant reduction in the uninsured rate (-2.1 percentage points, p=0.01), and no significant change in private insurance (+0.6 percentage points, p=0.46). Based on the pre-expansion mean uninsured rate of 45%, this reflects an approximate 5% relative decline in the uninsured rate for adults with incomes below 200% FPL.

In several sensitivity analyses (Table 2), point estimates for public coverage gains ranged from 1.0 to 2.0 percentage points, with p-values ranging from 0.02 to 0.09. There was no

evidence of a significant decline in private insurance in response to the LIHP expansion in any sensitivity analysis.

Table 3 presents results from subgroup analyses. Stratifying the sample into smaller groups often produced point estimates similar to those for the full sample but with less precision. Increases in public coverage were significant for both men and women, but significant only for childless adults (1.7 percentage points, p=0.03) and not for parents (1.2 percentage points, p=0.35). Public coverage gains were largest among people without disabilities (2.1 percentage points, p=0.01), people with limited English proficiency (4.2 percentage points, p=0.008), and Latinos (2.9 percentage points, p=0.02). Los Angeles County experienced a 2.5 percentage-point increase in public coverage (p=0.03) versus 1.5 percentage points in other expansion counties (p=0.06).

For most subgroups experiencing increased public coverage, we found significant reductions in uninsurance that were similar in size to the public coverage gains and no evidence of significant declines in private insurance. Among Latinos, however, the estimated decline in the uninsured rate was not statistically significant, and point estimates for private coverage were negative though not statistically significant.[5] Analyses considering ESI and non-group private insurance separately revealed little evidence of crowd-out of either type of insurance among groups with significant increases in public coverage (Appendix Table 2).

Appendix Table 3 shows potential spillover effects on low-income children, who were already eligible for Medicaid or CHIP prior to 2011. In the full sample of children under 200% FPL in expansion counties, we estimate a 3.2 percentage-point increase in public coverage (p=0.09). We find stronger evidence of an impact on certain subgroups of children – Latinos,

[5] The magnitudes of these coefficients suggest a crowd-out rate on the order of 35% for Latinos. This estimate comes from dividing the percentage-point change in public coverage (2.9%) by the percentage-point change in private insurance (-1.2%), as reported in Table 3.

children in families with limited English proficiency, and those in expansion counties other than Los Angeles.

Appendix Table 4 shows the results of our comparison of pre-expansion trends for expansion versus control counties. We find little evidence of divergence in these trends prior to 2011, with small non-significant point estimates for the full sample. For all the subgroups we considered, there were no statistically significant divergent trends for public coverage. For the uninsured rate and private insurance, we did detect significant differential trends for certain subgroups – for instance, a pre-expansion relative decline in the uninsured rate among Asians and a relative increase in the uninsured rate for Latinos in expansion counties prior to 2011. The latter finding suggests that, if anything, our analyses might underestimate true gains in coverage for Latinos due to the expansion. Overall, we observed nine coefficients with significant differential trends ($p<0.10$), compared to the six that would be expected out of 57 analyses simply by chance alone, using an alpha of 0.10.[6] This suggests that the pre-expansion trends in coverage were generally similar for our expansion and control groups.

DISCUSSION

In our analysis of California's Low-Income Health Program, we found a significant 1.8 percentage-point increase in public coverage among low-income adults in the first full year following the expansion, with larger increases found among Latinos and individuals with limited English proficiency. We found a 2 percentage-point decline in the uninsured rate among adults below 200% FPL in expansion counties, compared to control counties. While we did not find a significant decline in uninsurance among Latinos, our analysis of pre-expansion trends in

[6] This calculation assumes the results for each outcome and subgroup are independent, which is probably not the case – but this provides the lower bound of how many falsely significant results one would expect under ideal circumstances.

expansion and control counties suggests that we may be underestimating the change in uninsurance for this population after 2011. There was no significant reduction in the percentage of adults with private insurance, suggesting a lack of substantial crowd-out in the population as a whole.

Our general findings show some similarities and some differences with prior studies of expansions in Medicaid and other public coverage. After the Oregon Medicaid lottery, there were few notable differences in take-up rates across racial or ethnic groups, though Latinos were more likely to have their applications denied than whites or blacks (Allen et al., 2010). In contrast, we found larger increases in public coverage among low-income Latinos following the LIHP expansion in California than among other racial/ethnic groups. Unlike a previous study of early ACA expansions in Connecticut and Washington, D.C., we did not find that coverage increases were greatest among those with disabilities or self-reported health limitations (B. D. Sommers, Kenney, et al., 2014). These differences indicate the importance of considering distinct state populations and policy environments when identifying groups to target for outreach during coverage expansions.

Despite the increases in public coverage and the associated decreases in uninsurance following the early ACA-related expansion in California, high uninsured rates still prevailed in 2012 among many of the low-income groups targeted by the expansion. Even after the LIHP expansion's first full year, more than half of low-income Latinos and non-English speakers in our sample were uninsured. The extent to which the 2014 Medicaid expansion has closed these large remaining coverage gaps is an important area for future research.

We also found evidence of positive spillover effects on children eligible for Medicaid. Again, the largest gains in public coverage occurred among Latino families and those with

limited English proficiency. Such spillovers from adult expansions may be the result of increasing awareness of Medicaid, outreach to families containing both newly-eligible parents and previously-eligible children, and positive word of mouth in low-income communities. These kinds of spillovers from adult expansions are consistent with previous research on the interplay between public coverage for adults and children's take-up rates (Dubay & Kenney, 2003; B. D. Sommers, 2006), and indicate that the ACA's Medicaid expansion may improve coverage rates among children even though they were not directly targeted by the expansion.

While the LIHP is a program that has come and gone with the beginning of the ACA's Medicaid expansion in California (and other participating states) as of January 2014, our study demonstrates the feasibility of using the Census Bureau's newest and largest data source on health insurance to estimate the impacts of the ACA on coverage at the sub-state level. Due to the large sample size of the ACS and its detailed geographic identifiers, researchers can use the ACS to generate estimates of coverage changes for areas within states, both overall and among a variety of demographic subgroups. While administrative data also allow for detailed geographic analyses of coverage expansions, the ACS's survey design and information on the uninsured (in addition to those with coverage) enables quasi-experimental analyses that improve upon simple administrative enrollment statistics.

While the change in the Census definition of PUMAs in 2011 can pose challenges to constructing appropriate times series that span the 2011-2012 period such as ours, future analyses of the 2014 coverage expansions will fortunately be able to use two full years of pre-expansion data using the new PUMA boundaries. This will enable researchers to directly assess coverage changes before and after the 2014 coverage expansions among identically-defined levels of geography.

For evaluating California's LIHP, county-level policies were the key unit of interest; meanwhile, for the ACA's 2014 expansions, other units of within-state geography may also be relevant, such as Marketplace insurance rating areas, or neighborhoods within major urban centers. Depending on the state, the ACS enables analyses at various levels of detail, since the PUMAs are defined based on population size. In some less populous states, the number of PUMAs is more limited – for instance, 5 each in Alaska, North Dakota, and Wyoming, and 4 in Vermont, far fewer than the number of counties in each state. However, in more populous states, the number of PUMAs significantly exceeds the number of counties – for instance, 145 PUMAs spanning New York's 62 counties, enabling rich within-state analyses of New York City and other population centers. 17 states (including Washington, DC) have at least as many PUMAs as counties, which typically follow county lines to the extent possible,[7] and 31 states have county-to-PUMA ratios less than 2:1 (see Appendix Table 5). In short, the ACS is well-suited for analysis of within-state levels of geography, which vary by state and population density: PUMAs map closely to more populous individual counties, or alternatively, combinations of contiguous but less populous counties pooled into a single PUMA. For the LIHP, a county-based analysis was critical; for the ACA more generally, the ideal geographical unit for within-state analysis may be larger or smaller, depending on the state and research objective.

How reliable were our survey-based findings? Our full-sample estimate indicates that California's expansion increased net public insurance enrollment by 111,000 in its first full year.[8] This is consistent with the fact that the LIHP is only a small part of the total Medicaid

[7] The Census Bureau makes available state-by-state maps of PUMAs (using the more recent 2010 Census PUMAs) cross-listed by county. See <www.census.gov/geo/maps-data/maps/reference.html>, under "Public Use Microdata Areas (PUMA) Reference Maps."

[8] Individuals who were already enrolled in legacy state or county-funded insurance programs and transitioned into Medicaid would not appear as a change in coverage in our estimates, since the ACS combines Medicaid with other types of public insurance.

population in the state (Harbage & King, 2012) and represented only a limited portion of California's target population for the ACA's 2014 expansion, estimated to be 1.7 million statewide (P. Long & Gruber, 2011). A previous analysis of LIHP administrative statistics estimated that the 2012 monthly average enrollment in the counties included in our expansion group was roughly 200,000, after excluding those who were already enrolled in Medicaid or in California's pre-existing programs such as the Health Care Coverage Initiative (B. D. Sommers, Kenney, et al., 2014). This figure is nearly within the 95% confidence interval of our primary estimate (95% CI, 24,000-197,000), though the known undercount of Medicaid in Census surveys may have contributed factor to this difference (Call, Davidson, Davern, & Nyman, 2008). Furthermore, differences between measurement of income in the ACS and for Medicaid eligibility purposes may also account for some of this gap. Overall, while our point estimate for the public coverage change from the LIHP expansion may be an underestimate due to these factors, our results are within range of the likely enrollment changes and also add important information about changes in the uninsured rate, which cannot be obtained from administrative data. Thus, our findings suggest that the ACS can be used for reasonably precise and valid estimates of within-state changes in coverage, both at the population level and for subgroups that likely could not be studied with alternative surveys containing much smaller sample sizes.

Limitations

Our study has several important limitations. First, the differences-in-differences design assumes that the changes in coverage we observed were due to the LIHP expansion and not some other time-varying factors that were differentially changing for Expansion versus control counties. Since each county was able to select whether to expand and since there were also some

baseline differences in demographics across counties, it is possible that changes in unmeasured factors other than the expansion may be driving the observed findings. However, we provided both graphical and statistical evidence that pre-expansion coverage patterns were trending in similar directions among the expansion and control groups. Furthermore, our inclusion of numerous demographic and economic controls such as income and employment decreased the potential for such confounding.

There is also the risk of measurement error in the ACS, related to both income determination for the purposes of estimating Medicaid/LIHP eligibility and type of insurance coverage. As discussed earlier, the ACS may undercount Medicaid enrollment, which could lead to an underestimate of the overall LIHP coverage impact (O'Hara, 2010). This under-reporting may also vary by subgroup, which could bias our estimates of between-group differences in coverage. It is less likely that many respondents were confused about whether they were uninsured, even if they did not know the specific type of coverage that they had.

In terms of income classification, the ACS measures annual income, while Medicaid eligibility is determined based on monthly income, and incomes change frequently for many low-income households (B. D. Sommers & Rosenbaum, 2011). If our sample contained some individuals who were in fact *not* eligible for Medicaid or LIHP based on income, our estimates of coverage gains would be biased towards zero.

Finally, our results only capture the first year of the expansion results and are from a single state that already had a county-based expansion program in effect (the Health Care Coverage Initiative) prior to 2010. Moverover, the LIHP has since been replaced by the full ACA Medicaid expansion since the study period. These factors may limit the generalizability of our conclusions. Previous coverage expansions such as the Children's Health Insurance Program

(CHIP) suggest that these policies typically take years longer to reach steady-state (B. D. Sommers et al., 2012), and the pattern of enrollment across subgroups in subsequent years may differ from what we observed here. Furthermore, while California offers a large and diverse population that in many ways resembles the U.S. population as a whole, state Medicaid programs vary greatly in participation rates and outreach efforts (Kenney, Lynch, Haley, & Huntress, 2012), and expansions occurring in states without pre-existing waiver programs may experience larger gains than those noted here. As such, it is unclear how directly our findings can be extrapolated to other states.

Conclusion

California's early public coverage expansion under the ACA, which relied on county-level implementation, produced significant increases in coverage for low-income adults, particularly among Latinos and individuals with limited English proficiency. Our study demonstrates the feasibility of using of the American Community Survey to conduct sub-state analyses of coverage and subgroup analyses, both of which will add valuable detail to future assessments of the ACA's impact on insurance coverage in states and communities across the nation.

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TABLE 1:
Descriptive Statistics for the Study Sample

Characteristic	Expansion Counties (n=10)	Control Counties (n=7)
Age	37.0	36.1
Male	49.1%	50.2%
Married	33.2%	35.0%
Parent	28.9%	33.1%
Race		
-White	51.8%	62.1%
-Black	8.0%	7.3%
-Asian	14.6%	9.4%
-Other	25.6%	21.2%
Latino Ethnicity	51.6%	47.7%
-Mexican	41.5%	44.4%
-Non-Mexican	10.0%	3.3%
Not Proficient in English	38.3%	29.2%
Education		
-Did not finish high school	31.7%	32.8%
-High school graduate only	55.1%	60.0%
-Some college	13.2%	7.2%
Non-Citizen	34.0%	26.8%
Non-Citizen in Family	57.6%	49.6%
Income (% FPL)	89.6%	87.1%
Working Full-Time	53.6%	52.6%
Disabled	11.7%	16.2%

Notes:
Data are from the American Community Survey, 2008-2012. Differences were significant at $p < 0.01$ for all variables. Sample contains adults ages 19-64 with family incomes at or below 200% FPL (n=237,876).

TABLE 2:
Differences-in-Differences Estimates of Coverage Changes among Low-Income Adults after California's Public Coverage Expansion

Group / Model	Baseline Public Coverage	Change in Public Coverage	Baseline Uninsured	Change in Uninsured	Baseline Private Insurance	Change in Private Insurance
Primary Analysis	17.4%	1.8%**	45.1%	-2.1%**	31.9%	0.6%
Sensitivity Analyses: Alternative Samples						
Excluding Non-Citizens < 5 years in U.S.	17.7%	1.5%**	43.5%	-1.4%*	32.8%	0.2%
Excluding 19-25 year olds	18.9%	1.7%**	45.4%	-3.2%***	29.2%	1.4%
Including 2011 data (no washout year)	17.4%	1.0%*	45.1%	-1.2%	31.9%	0.5%
Sensitivity Analyses: Alternative Treatment Groups						
Counties expanding to at least 100% FPL in 2011	17.1%	1.8%**	46.1%	-1.9%**	31.1%	0.5%
Counties expanding to at least 133% FPL in 2011; sample limited to those with income < 133% FPL	20.3%	2.0%*	47.5%	-1.6%*	26.3%	0.1%
Including Jan. 2012 expanders	18.4%	1.5%**	44.6%	-1.7%**	30.9%	0.6%
Including 2012 mid-year expanders	18.5%	1.4%**	44.5%	-1.7%**	30.9%	0.6%

Notes:
Data are from the American Community Survey, 2008-2012. Primary analysis contains adults ages 19-64 with family incomes at or below 200% FPL (n=237,876).
"Baseline" columns show the pre-2011 mean for each coverage outcome in the expansion counties' population for each particular model.
*p<0.10, **p<0.05, ***p<0.01.
All estimates were adjusted for age, gender, marital status, parental status, race/ethnicity, citizenship (individual and household), family income, employment, disability, education, year, and county of residence. Standard errors were clustered by county.

TABLE 3:
Subgroup Estimates of Coverage Changes among Low-Income Adults after California's Public Coverage Expansion

Subgroup	Baseline Public Coverage	Change in Public Coverage	Baseline Uninsured	Change in Uninsured	Baseline Private Insurance	Change in Private Insurance
Income ≤ 133% FPL	20.9%	1.9%*	46.5%	-1.8%**	26.6%	0.3%
Income > 133% FPL	9.3%	1.3%	41.8%	-3.4%*	43.9%	2.2%
Self-Reported Disability	37.2%	0.7%	24.4%	-1.7%	13.9%	1.8%
No Disability	14.7%	2.1%**	47.8%	-2.2%**	34.3%	0.4%
Women	21.5%	2.1%**	40.4%	-2.7%**	33.0%	1.0%
Men	13.1%	1.6%**	49.9%	-1.6%*	30.8%	0.3%
White non-Latino	15.0%	0.3%	31.5%	-0.5%	43.4%	1.6%
Black non-Latino	28.3%	1.2%	34.4%	-0.8%	26.8%	-1.0%
Asian non-Latino	16.7%	-0.5%	36.4%	-6.5%**†	42.2%	8.5%***†
All Latino	16.9%	2.9%**†	55.8%	-1.8%	24.3%	-1.2%
Mexican	17.3%	2.7%**†	55.5%	-1.8%	24.3%	-1.0%
Non-Mexican Latino	15.5%	4.5%	56.7%	-2.0%	24.6%	-2.2%
Limited English proficiency	18.0%	4.2%***†	57.4%	-3.9%**	21.4%	0.3%
Speaks English 'Very Well'	16.9%	0.5%	37.1%	-1.1%	38.7%	0.9%
Parent	25.8%	1.2%	40.5%	-2.9%	31.1%	1.9%
Childless Adult	13.9%	1.7%**	47.0%	-1.3%**	32.3%	-0.0%
Los Angeles County (≤133% FPL)	21.3%	2.5%**	50.3%	-2.0%**	23.2%	0.2%
All other expansion counties (≤200% FPL)	17.1%	1.5%*	41.3%	-2.0%**	34.9%	0.9%

Notes:
Data are from the American Community Survey, 2008-2012.
"Baseline" columns show the pre-2011 mean for each coverage outcome in the expansion counties' population for each particular subgroup.
*p<0.10, **p<0.05, ***p<0.01.
† indicates p<0.05 for between-group comparison of the differences-in-differences coefficients, which was estimated using a model containing the full set of interaction terms between each covariate and the subgroup identifier. For race/ethnicity, the reference group for comparisons was White non-Latino.

All models controlled for age, gender, marital status, parental status, race/ethnicity, citizenship (individual and household), family income, employment, disability, education, year, and county of residence. Standard errors were clustered by county.

FIGURE 1a: Public Coverage Among Low-Income Adults in California, 2008-2012

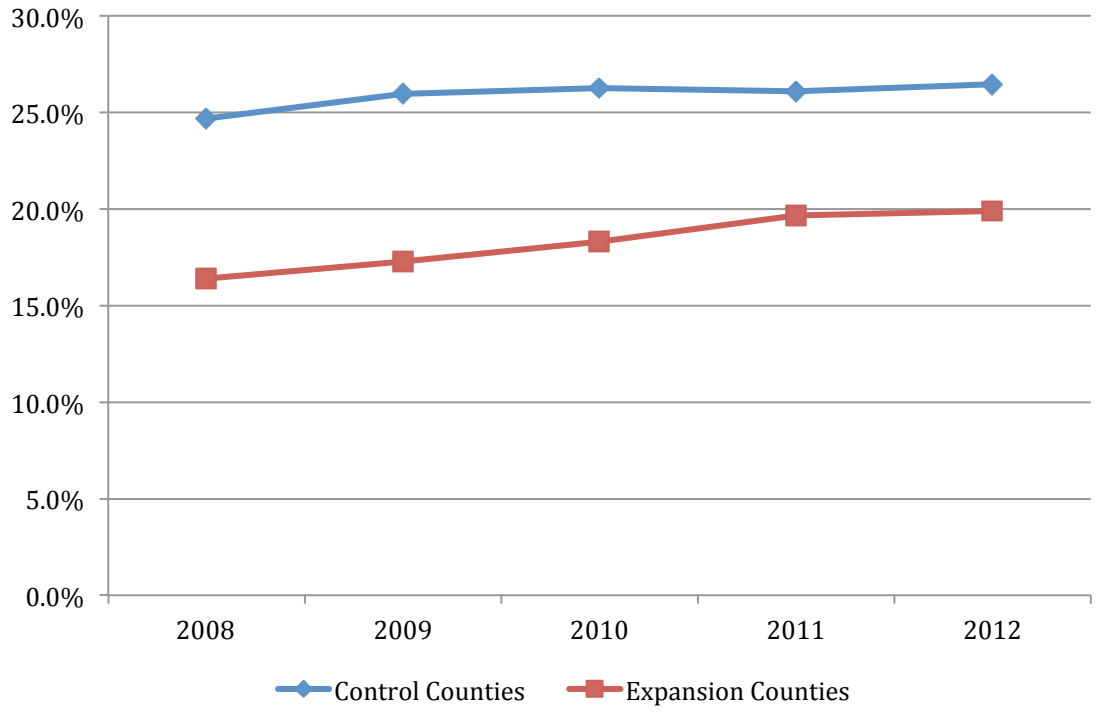


FIGURE 1b: Difference in Public Coverage Between Expansion and Control Counties

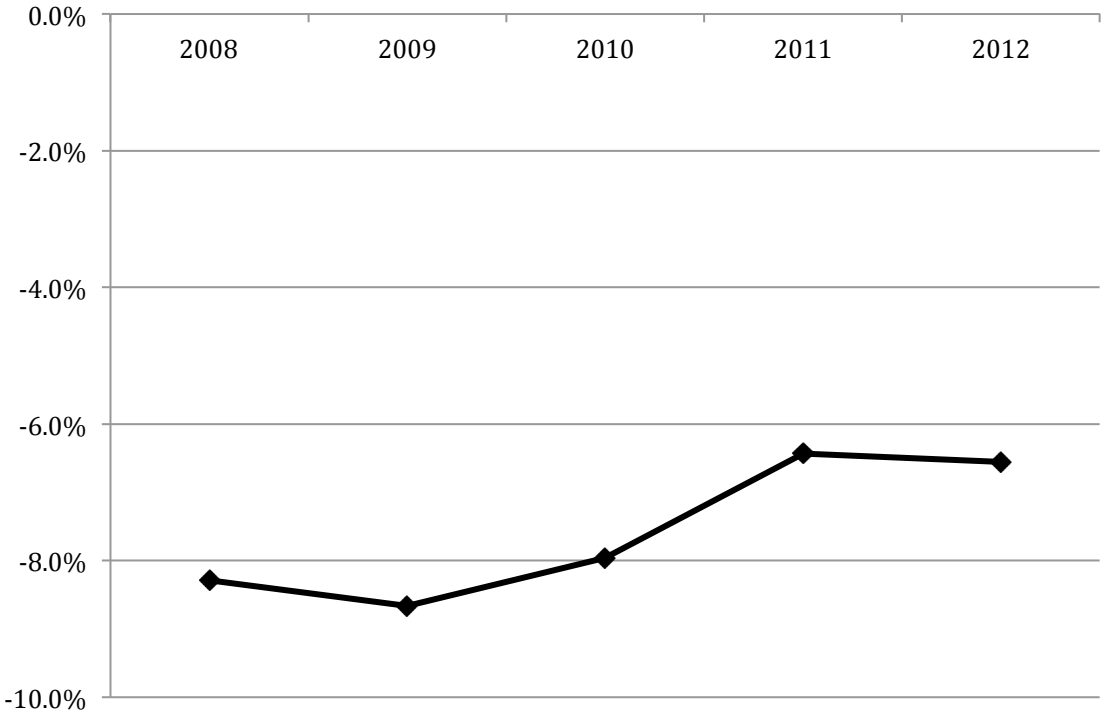


FIGURE 2a: Uninsured Rates Among Low-Income Adults in California, 2008-2012

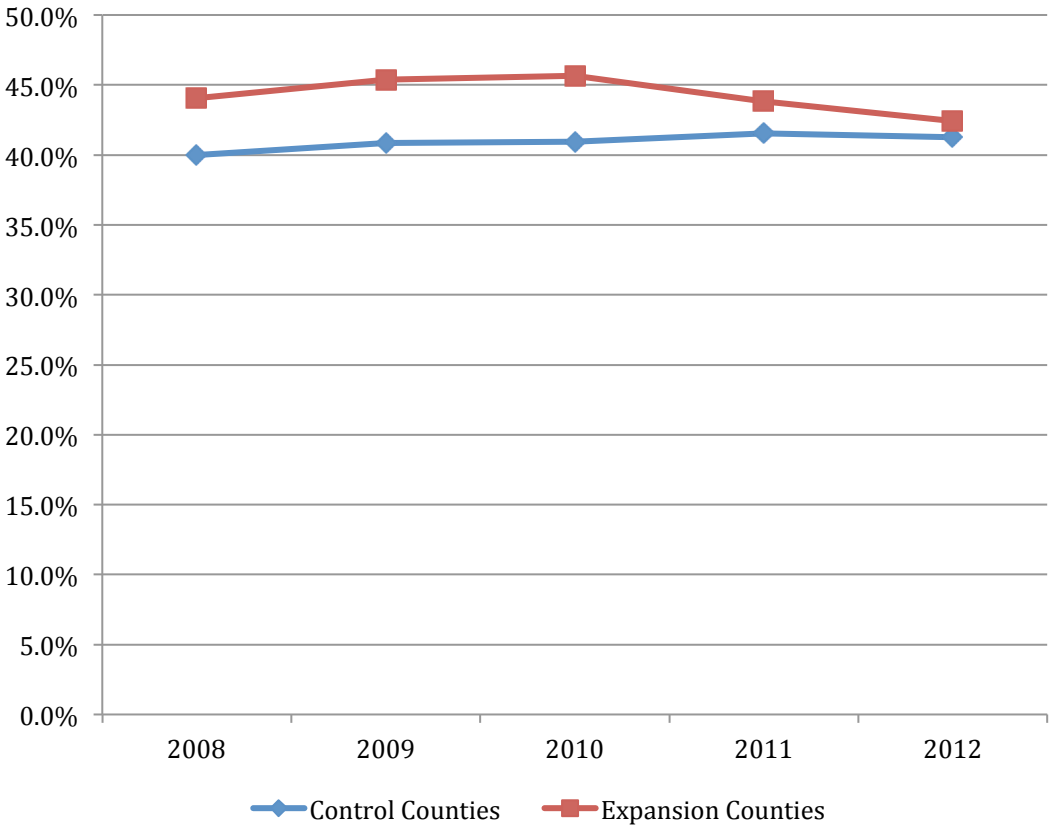
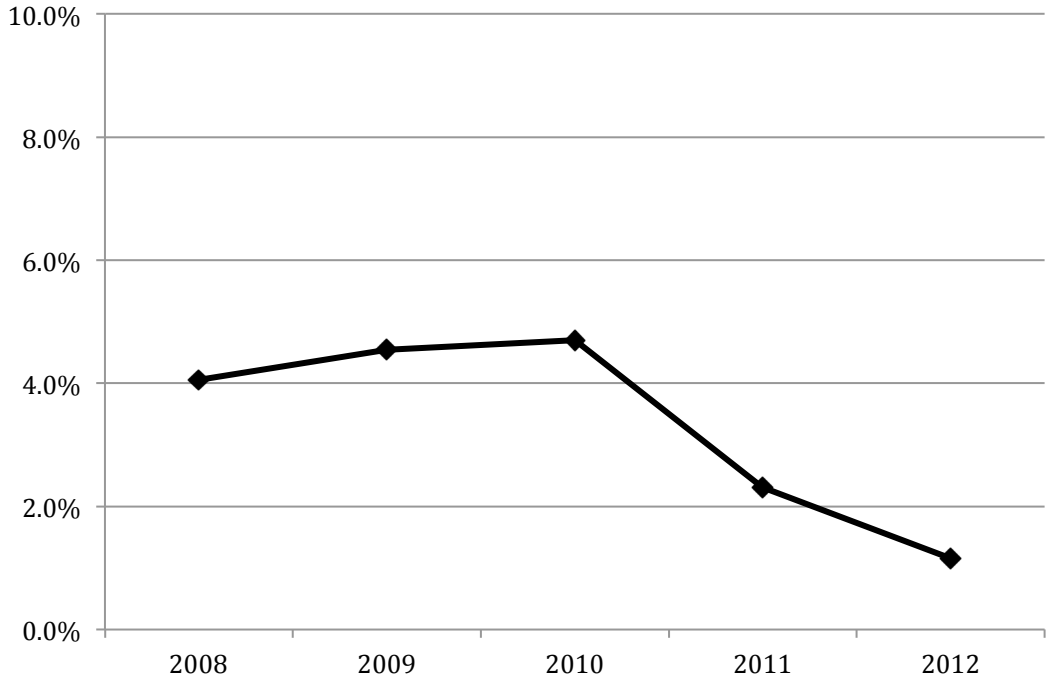


FIGURE 2b: Difference in Uninsured Rates Between Expansion and Control Counties



APPENDIX TABLE 1:
California Counties' Early Expansion Policies and Study Groupings

County Name	Early Expansion (Y/N)	Date of Expansion	Control, Expansion, or Sensitivity Analyses only†	Income Cutoff (% FPL)
Alameda	Y	July 2011	Expansion	200%
Contra Costa	Y	July 2011	Expansion	200%
CMSP*	Y	January 2012	Sensitivity†	100%
Fresno	N	N/A	Control	N/A
Kern	Y	July 2011	Expansion	100%
Los Angeles	Y	July 2011	Expansion	133%
Merced	Y	January 2013	Control	100%
Monterey	Y	October 2012	Excluded§	100%
Orange	Y	July 2011	Expansion	200%
Placer	Y	August 2012	Sensitivity†	100%
Riverside	Y	January 2012	Sensitivity†	133%
Sacramento	Y	October 2012	Control	67%
San Bernardino	Y	January 2012	Sensitivity†	100%
San Diego	Y	July 2011	Expansion	133%
San Francisco	Y	July 2011	Expansion	25%
San Joaquin	Y	June 2012	Sensitivity†	80%
San Luis Obispo	N	N/A	Control	N/A
San Mateo	Y	July 2011	Expansion	133%
Santa Barbara	N	N/A	Control	N/A
Santa Clara	Y	July 2011	Expansion	75%
Santa Cruz	Y	January 2012	Sensitivity†	100%
Stanislaus	N	N/A	Control	N/A
Tulare	Y	January 2013	Control	100%
Ventura	Y	July 2011	Expansion	200%

Notes:

*CMSP includes 35 counties: Alpine, Amador, Butte, Calaveras, Colusa, Del Norte, El Dorado, Glenn, Humboldt, Imperial, Inyo, Kings, Lake, Lassen, Madera, Marin, Mariposa, Mendocino, Modoc, Mono, Napa, Nevada, Plumas, San Benito, Shasta, Sierra, Siskiyou, Solano, Sonoma, Sutter, Tehama, Trinity, Tuolumne, Yolo, Yuba. Yolo County expanded in July 2012, while all others in the CMSP expanded in January 2012.

†Counties that expanded in the first 9 months of 2012 were excluded from the main analysis since we were unable to distinguish the month of the year in the dataset. These counties were included as expansion states in sensitivity analyses.

§Monterey expanded in October 2012, but in the 2012 ACS data this county is combined with San Benito, which expanded in January 2012. Giving this, we excluded both counties from our analyses.

APPENDIX TABLE 2:
Changes in Employer-Sponsored Insurance and Non-Group Coverage Among Low-Income Adults after California's Public Coverage Expansion

Subgroup	Baseline ESI	Change in ESI	Baseline Non-Group Coverage	Change in Non-Group Coverage
Full sample	23.5%	1.2%	8.4%	-0.6%
Income ≤ 133% FPL	17.9%	1.0%	8.7%	-0.7%
Income > 133% FPL	36.3%	2.4%	7.6%	-0.2%
Self-Reported Disability	10.1%	2.1%	3.8%	-0.3%
No Disability	25.3%	1.1%	9.0%	-0.6%
Women	24.2%	1.6%	8.8%	-0.6%
Men	22.8%	0.9%	8.0%	-0.6%
White non-Latino	27.1%	3.4%*	16.2%	-1.9%*
Black non-Latino	22.5%	1.4%	4.4%	-2.4%***
Asian non-Latino	25.9%	5.6%**	16.3%	2.9%**
All Latino	21.3%	-0.8%	3.0%	-0.4%
Mexican	21.5%	-0.8%	2.7%	-0.2%
Non-Mexican Latino	20.3%	0.0%	4.3%	-2.2%
Limited English proficiency	17.0%	0.2%	4.4%	0.2%
Speaks English 'Very Well'	27.8%	1.9%	10.9%	-1.0%
Parent	26.3%	1.8%	4.7%	0.1%
Childless Adult	22.4%	0.9%	9.9%	-0.9%
Los Angeles County (<133% FPL)	16.0%	0.4%	7.2%	-0.2%
All other expansion counties (<200% FPL)	25.3%	1.9%	9.7%	-1.0%*

Notes:
Data are from the American Community Survey, 2008-2012. Full sample contains adults ages 19-64 with family incomes at or below 200% FPL (n=237,876).
"Baseline" columns show the pre-2011 mean for each coverage outcome in the expansion counties' population for each particular subgroup.
"ESI" = Employer-Sponsored Insurance
*p<0.10, **p<0.05, ***p<0.01.
All estimates were adjusted for age, gender, marital status, parental status, race/ethnicity, citizenship (individual and household), family income, employment, disability, education, year, and county of residence. Standard errors were clustered by county.

APPENDIX TABLE 3:
Spillover Coverage Changes among Low-Income Children after California's Public Coverage Expansion for Adults

Subgroup	Baseline Public Coverage	Change in Public Coverage	Baseline Uninsured	Change in Uninsured	Baseline Private Insurance	Change in Private Insurance
All Children	56.8%	3.2%*	16.1%	-1.8%	25.5%	-0.3%
Income ≤ 133% FPL	63.1%	2.8%	16.1%	-1.5%	19.2%	-0.2%
Income > 133% FPL	41.2%	4.8%*	15.9%	-3.3%	41.3%	-0.7%
White non-Latino	38.3%	-2.2%	11.7%	0.5%	47.1%	1.8%
Black non-Latino	62.0%	-2.6%	9.6%	-1.3%	25.9%	5.4%*
Asian non-Latino	46.3%	0.9%	14.4%	-4.1%	36.6%	3.0%
All Latino	60.9%	4.7%*	17.8%	-1.6%*	20.2%	-1.6%
Mexican	61.3%	4.4%*	17.6%	-1.1%	20.0%	-1.8%
Non-Mexican Latino	57.9%	8.8%	19.2%	-10.0%*	21.4%	1.5%
Limited English proficiency	64.4%	6.0%***	19.4%	-1.9%	15.2%	-2.6%*
Speaks English 'Very Well'	52.4%	1.9%	13.0%	-1.4%	32.6%	0.3%
Los Angeles County (<133% FPL)	66.7%	1.7%	15.9%	-1.5%	16.4%	0.8%
All other expansion counties (<200% FPL)	53.0%	4.4%**	16.0%	-2.1%	28.7%	-1.1%

Notes:
Data are from the American Community Survey, 2008-2012. Full sample contains children ages 0-18 with family incomes at or below 200% FPL (n=113,159).
"Baseline" columns show the pre-2011 mean for teach coverage outcome in the expansion counties' population for each particular subgroup.
*p<0.10, **p<0.05, ***p<0.01.
All estimates were adjusted for age, gender, race/ethnicity, citizenship (individual and household), family income, disability, education, year, and county of residence. Standard errors were clustered by county.

APPENDIX TABLE 4:
Comparison of Pre-Expansion Coverage Trends for Low-income Adults Between Expansion and Control Counties

Population	Public Coverage Trend	Uninsured Trend	Private Insurance Trend
Full Sample	0.2%	0.6%	-0.6%
Subgroups			
Income ≤ 133% FPL	0.2%	0.3%	-0.4%
Income > 133% FPL	0.2%	1.4%*	-0.8%
Self-Reported Disability	0.9%	0.9%	-1.7%**
No Disability	0.2%	0.5%	-0.4%
Women	0.2%	0.2%	-0.6%
Men	0.0%	0.9%	-0.5%
White non-Latino	0.1%	0.4%	-0.1%
Black non-Latino	0.3%	1.0%	-1.6%
Asian non-Latino	0.3%	-3.0%**	2.0%
All Latino	-0.3%	1.3%**	-0.7%
Mexican	-0.2%	1.3%*	-0.8%
Non-Mexican Latino	-1.8%	1.2%	0.8%
Limited English proficiency	0.2%	1.3%*	-1.3%**
Speaks English 'Very Well'	0.1%	0.3%	-0.4%
Parent	-0.5%	0.7%	-0.1%
Childless Adult	0.5%	0.4%	-0.7%
Los Angeles County (<133% FPL)	0.1%	1.0%**	-0.9%**
All other expansion counties (<200% FPL)	0.2%	0.2%	-0.3%

Notes:
Data are from the American Community Survey, 2008-2010.
*p<0.10, **p<0.05, ***p<0.01.
Estimates represent the additional change in outcome per year in the expansion group relative to the control group. All estimates were adjusted for age, gender, marital status, parental status, race/ethnicity, citizenship (individual and household), family income, employment, disability, education, year, and county of residence.

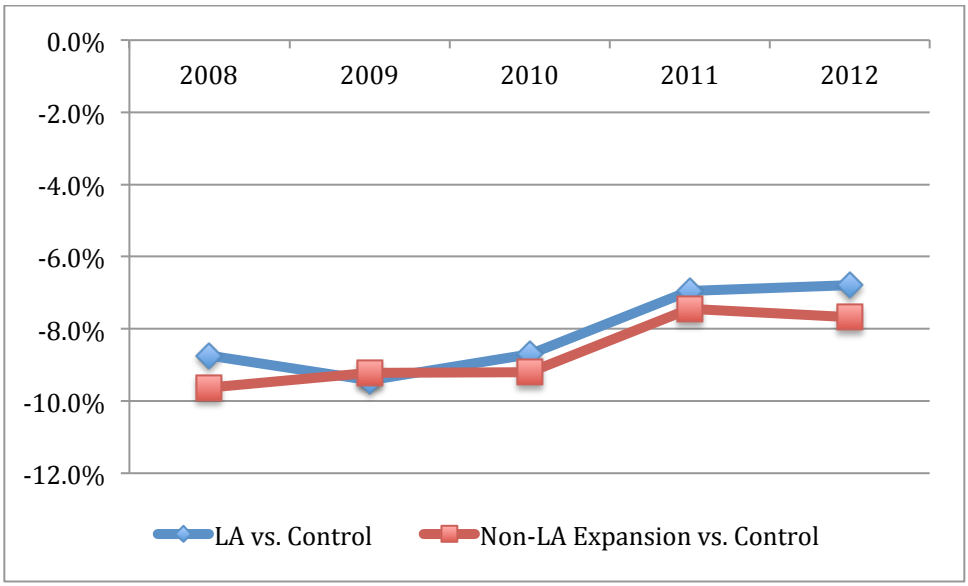
APPENDIX TABLE 5:
Number of Counties versus PUMAs by State (2010 Census PUMAs)

State	Counties†	PUMAs
Alabama	67	34
Alaska	30	5
Arizona	15	54
Arkansas	75	20
California	58	265
Colorado	64	42
Connecticut	8	26
Delaware	3	5
DC	1	6
Florida	67	151
Georgia	159	72
Hawaii	5	10
Idaho	44	14
Illinois	102	88
Indiana	92	50
Iowa	99	22
Kansas	105	22
Kentucky	120	34
Louisiana	64	34
Maine	16	10
Maryland	24	44
Massachusetts	14	52
Michigan	83	68
Minnesota	87	43
Mississippi	82	21
Missouri	115	47
Montana	56	7
Nebraska	93	78
Nevada	17	5
New Hampshire	10	10
New Jersey	21	73
New Mexico	33	18
New York	62	145
North Carolina	100	14
North Dakota	53	18
Ohio	88	93
Oklahoma	77	28
Oregon	36	31
Pennsylvania	67	92
Rhode Island	5	7
South Carolina	46	30
South Dakota	66	6
Tennessee	95	49
Texas	254	212
Utah	29	22
Vermont	14	4
Virginia	133	56
Washington	55	13
West Virginia	39	56

Wisconsin	72	40
Wyoming	23	5

NOTES:
† County or county-equivalents. Source: U.S. Census Bureau, "County Totals Datasets: Population, Population Change and Estimated Components of Population Change: April 1, 2010 to July 1, 2012," Accessed at: <http://www.census.gov/popest/data/counties/totals/2012/CO-EST2012-alldata.html>

APPENDIX FIGURE 1:
Difference in Public Coverage Between Expansion and Control Counties: Los Angeles versus Other Expansion Counties



APPENDIX FIGURE 2:
Difference in Uninsured Rates Between Expansion and Control Counties: Los Angeles versus Other Expansion Counties